DNTP Strategic Portfolio

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Outline

• Portfolio strategy – structure, planning, management
• Delivering on strategic research priorities
• Addressing contemporary topics
• Increasing our impact – focus on stakeholders, products, execution
DNTP Goals

1. Collaborate with public stakeholders and global partners to identify and address public health issues.

2. Generate and communicate trusted scientific information to support decision-making on environmental hazards of public interest.

3. Lead the transformation of toxicology through the development and application of innovative tools and strategies.

4. Educate and train the next generation of translational scientists to be innovative leaders in the field.
DNTP Strategic Objectives

- Accelerate our progress in the evolution toward a more predictive, precise, and preventive science through the deliberate application of a translational toxicology pipeline of capabilities

- Provide an evidence-based approach to identifying and understanding potential environmental contributors to contemporary and common diseases

- Improve our ability to conduct and communicate substance-based hazard evaluations that are more translational, innovative and responsive
DNTP Research Programs

- Combined Exposures and Mixtures (CEM)
- Consumer Products and Therapeutics (CPT)
- Occupational and Inhalation Exposures (OIE)
- Emerging Contaminants and Issues of Concern (ECIC)
- Safe and Sustainable Alternatives (SSA)
- Carcinogenesis (Cari)
- Cardiovascular (CV)
- Developmental Neurotoxicity (DNT)
- Novel Tools and Approaches (NTA)
- Scientific Cyberinfrastructure (SCI)

Portfolio Composition

- Not 10 independent programs
- Intersections of projects, people, and processes
- Connectivity is necessary and intentional
  - Leverage => feature
  - Dependency =>
Strategic Program Planning Outputs

• Program Management Teams (PMTs) formulated strategy, objectives, projects, milestones

• Engaged with NTP Board of Scientific Counselors (BSC)
  – Completed 5 meetings in 9 months, reviewed all 10 programs, effort from >60 DNTP staff

• Program Plans (10)
• Objectives (30)
• Strategic Research Priorities (12)
Determining Strategic Priorities

- Opportunity, need, importance
- Capability, capacity, feasibility
- Resources and effort required, staff expertise and availability, timelines, external pressures
- Integrative, leveraging capabilities and partnerships
- Not overly broad topics e.g., “mixtures” or exposome
- Not specific exposures or substances or approaches
- Not formulaic – no scoring, ranking, etc.
Cross-Cutting Topics

Output and outcome metrics
How to best measure success and ensure DNTP science is impactful?

Equity, diversity, and inclusion
How to account for sociocultural factors that lead to environmental health disparities?

Capability building for the future
How to foster a culture of innovative, forward thinking?

Optimizing stakeholder engagement and communication
How to tailor approaches and products for diverse audiences and purposes?
Program Research Priorities

Objective 1. Accelerate our progress toward becoming a more predictive, precise, and preventive science through the deliberate application of a translational toxicology pipeline of capabilities

1.1 Define and apply an innovative approach to identifying and characterizing hazards of complex and/or combined exposures for existing project areas (botanical dietary supplements, natural mineral fibers, HIV therapeutics)

1.2 Develop and apply defined approaches to infer hazard across specific structural (organohalogen flame retardants) and functional (personal care products) substance classes

1.3 Develop and qualify effective tools and approaches to support timely research responses to emerging public health issues and the assessment of safer alternatives
Program Research Priorities

Objective 2. Provide an evidence-based approach to identifying and understanding potential environmental contributors to contemporary and common diseases

2.1 Define and apply a suite of screening approaches to evaluate bioactivities critical to understanding carcinogenicity, cardiovascular toxicity and altered neurodevelopment

2.2 Characterize the likelihood that specific environmental exposures represent human-relevant carcinogenic, cardiovascular and developmental neurotoxic hazards by defining, developing and adapting a pipeline of internal and external laboratory and computational assessment capabilities

2.3 Develop and apply an approach to identify and characterize the contributions of environmental exposures to a specific cardiovascular disease (gestational hypertension) and cancer (early onset colorectal carcinoma)
Objective 3. Improve our ability to conduct and communicate substance-based hazard evaluations that are more translational, innovative and responsive

3.1 Develop and evaluate a suite of complex in vitro 3D cellular systems (spheroids, organoids) to model human-relevant organ-specific toxicity to support current portfolio priorities

3.2 Develop and evaluate a suite of multiscale computational models to support current portfolio priorities

3.3 Assemble and support a robust scientific cyberinfrastructure and advanced informatics tool set to enhance and expand the delivery of DNTP knowledge products
Delivering Priorities

Objective 2. Provide an evidence-based approach to identifying and understanding potential environmental contributors to contemporary and common diseases

2.1 Define and apply a suite of screening approaches to evaluate bioactivities critical to understanding carcinogenicity, cardiovascular toxicity and altered neurodevelopment

Relevant Projects
- High-throughput bioactivity assessment via CardioToxPi
- In silico model of hERG inhibition
- In vitro assessment of cardiovascular toxicant mechanisms
- Utilization of microphysiological systems to incorporate xenobiotic metabolism in cardiovascular toxicity screening

Key Actions
- Outputs
- Timeline
4.1 Refine current toxicology study and assessment approaches to better understand and account for social determinants of health

4.2 Selectively adapt current projects to address the disproportionate impacts of climate change on individuals and populations

4.3 Define creative approaches to effectively engage scientific, policy and community stakeholders to increase the impact of DNTP research products
Social Determinants of Health (SDOH)

Healthy People 2030

“Social determinants of health (SDOH) are the conditions in the environments where people are born, live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality-of-life outcomes and risks.”

• Intricately tied to physical determinants of health e.g. natural and built environments, exposure to hazardous substances and conditions

DNTP Projects Relevant to SDOH

- Geospatial exposure, disparity, and risk mapping (K. Messier)

- Hazard characterization and assessment of substances/exposures with evidence of disproportionate impacts e.g., glyphosate, PAHs

- Scoping reviews of the association between chemicals in personal care products and timing of fetal growth and puberty

- Literature review on impact of psychosocial stressors related to health disparities and Environmental Exposures on cardiovascular health effects in women of U3 populations

4.1 Refine current toxicology study and assessment approaches to better understand and account for social determinants of health
Addressing Racism as a Public Health Issue

NIEHS and community partners organized this workshop to –

• Raise awareness of the problem of systemic racism in America and its contributing role to Environmental Health Disparities (EHD)

• Inform the NIEHS community of current EHD research and outreach activities in Environmental Justice (EJ)

• Engage regional and local community leaders involved in EJ advocacy networks to discuss best practices for community engagement

https://tools.niehs.nih.gov/conference/ejworkshop2021/
Climate Change and Human Health

4.2 Selectively adapt current projects to address the disproportionate impacts of climate change on individuals and populations.

Impact of Climate Change on Human Health

- Injuries, fatalities, mental health impacts
- Asthma, cardiovascular disease
- Malaria, dengue, encephalitis, hantavirus, Rift Valley fever, Lyme disease, chikungunya, West Nile virus
- Respiratory allergies, asthma
- Malnutrition, diarrheal disease
- Cholera, cryptosporidiosis, campylobacter, leptospirosis, harmful algal blooms

Climate drivers:
- Increased temperatures
- Precipitation extremes
- Extreme weather events
- Sea level rise

Exposure pathways:
- Extreme heat
- Poor air quality
- Reduced food & water quality
- Changes in infectious agents
- Population displacement

Health outcomes:
- Heat-related illness
- Cardiopulmonary illness
- Food-, water-, & vector-borne disease
- Mental health consequences & stress

Environmental & institutional context:
- Land-use change
- Ecosystem change
- Infrastructure condition
- Geography
- Agricultural production & livestock use

Social & behavioral context:
- Age & gender
- Race & ethnicity
- Poverty
- Housing & infrastructure
- Education
- Discrimination
- Access to care & community health infrastructure
- Preexisting health conditions


https://www.cdc.gov/climateandhealth/effects/default.htm
Climate Change Health Impacts Research in DNTP

- Harmful algal blooms – cyanotoxins drinking water toxicology studies
- Molds and mycotoxins – fungal aerosol inhalation toxicology studies
- Wildfires – woodsmoke cancer hazard evaluation
- Heightened risk of vulnerable populations – susceptibility to immune dysfunction
- Emergent diseases – chronic kidney disease of uncertain/nontraditional etiology (CKDu)

4.2 Selectively adapt current projects to address the disproportionate impacts of climate change on individuals and populations
DNTP Has Many Stakeholders

With diverse roles and relationships -

partner, collaborator, advocate, interested party, technical advisor, data/information user, community, individual, service provider
Stakeholder Engagement

• Identification
  – Who is interested, affected, can help...

• Types of interactions
  – Consultation, information sharing, inquiries, referrals, briefings

• Mechanisms
  – Formal or informal partnership

• Levels of engagement
  – Connection, one-time, info exchange or technical input
  – Coordination, time-limited, specific topic
  – Collaboration, sustained, joint effort on 1 or more topics

4.3 Define creative approaches to effectively engage scientific, policy and community stakeholders to increase the impact of DNTP research products
Beyond Traditional Products

- Articles, reports, monographs
- Tools, datasets, knowledge bases
- Influence, service, training
- Advice and decision support
- Timing and pace of delivery
- Content and audience
- Scale and reach
Path to Impact Is Iterative and Interconnected

Translational Toxicology Pipeline

- Engaging with stakeholders
- Delivering useful products
Implementation of Portfolio Strategy

• Define key actions, deliverables and timelines across all programs to guide tactical decisions

• Improve project and resource management

• Plan future BSC engagements focused on foundational and cross-cutting topics
Summary

• DNTP research portfolio is organized around overarching strategic objectives

• Individual research programs align to those objectives while tackling important opportunities in our mission space

• Strategic research priorities will guide focused effort over next 3 years, delivered by executing projects from across all programs

• Our strategy and operational model affords flexibility to apply resources and areas of strength to address timely and important public health issues

• Stakeholder interests and needs drive the work we do, establishing and nurturing these interactions at scale requires creative approaches

• Our knowledge products effectively reach traditional scientific and regulatory audiences, much greater impact could be realized by developing novel outputs